YASKAWA

Networking Solutions

TM | 900-2C5x0 | Manual

HB39 | TM | 900-2C5x0 | en | 18-18

TM-C Router

VIPA CONTROLS

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900-2C5x0_000_TM-C Router,3,GB - © 2018

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1 General

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This customer document describes all the hardware units and functions known at the present time. Descriptions may be included for units which are not present at the customer site. The exact scope of delivery is described in the respective purchase contract.

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Email: support@yaskawa.eu

1.2 About this manual

Objective and contents

This manual describes the Teleservice module 900-2C5x0 from YASKAWA. It contains a description of the structure, project engineering and deployment.

Product	Order number	as of state: TM-FW
TM-C Router	900-2C5x0	9.0

Target audience

The manual is targeted at users who have a background in automation technology.

Structure of the manual

The manual consists of chapters. Every chapter provides a self-contained description of a specific topic.

Guide to the document

The following guides are available in the manual:

- An overall table of contents at the beginning of the manual
- References with page numbers

Availability

The manual is available in:

- printed form, on paper
- in electronic form as PDF-file (Adobe Acrobat Reader)

Icons Headings

Important passages in the text are highlighted by following icons and headings:

DANGER!
Immediate or likely danger. Personal injury is possible.

CAUTION!
Damages to property is likely if these warnings are not heeded.

Supplementary information and useful tips.

1.3 Safety information

Applications conforming with specifications

The system is constructed and produced for:

- communication and process control
- general control and automation tasks
- industrial applications
- operation within the environmental conditions specified in the technical data
- installation into a cubicle

DANGER!
This device is not certified for applications in

– in explosive environments (EX-zone)

Documentation

The manual must be available to all personnel in the

- project design department
- installation department
- commissioning
- operation

CAUTION!
The following conditions must be met before using or commissioning the components described in this manual:

– Hardware modifications to the process control system should only be carried out when the system has been disconnected from power!
– Installation and hardware modifications only by properly trained personnel.
– The national rules and regulations of the respective country must be satisfied (installation, safety, EMC ...)

Disposal

National rules and regulations apply to the disposal of the unit!

2 Product Summary

2.1 Introduction

The present Manual describes the hardware of the YASKAWA TM-C modules. The VIPA TM-C modules are 3 industrial routers. The TM-C modules are fully compatible with the Talk2M cloud connectivity services (*www.talk2M.com*).

2.2 Versions

The VIPA TM-C is available in 3 different versions depending on their communication interface:

2.3 Order numbers

Order Number	Type	Description
900-2C510	TM-C	VPN Router WAN/LAN
900-2C520	TM-C	VPN Router WIFI/WAN/LAN (Antenna included in delivery)
900-2C580	TM-C	VPN Router 3G+/WAN/LAN (Antenna 900-0AB51 optional)
900-0AB51		TM-Antenna GSM/GPRS/UMTS

2.4 Properties

Characteristic	Value
Design	Industrial design (24 VDC power supply, DIN Rail mounting, extended temperature)
Processor	ARM9
Clock	Backed up real time clock (RTC) Backup battery lifetime has 10 years expectancy
Ethernet Interface	LAN Ethernet port 10/100 Mbps
Digital Input	2
Digital Output	1
Mounting	Latch for DIN rail EN50022-compliant

2.5 Typical applications

- Remote Access of Ethernet devices using Talk2M connection
- Industrial VPN router

3 Safety, Environmental and Regulatory Information

3.1 Scope

The present heading addresses Safety, Environmental & Regulatory Information for the VIPA TM-C modules.

3.2 Power supply

The external power supply is a third party device that is not part of this certification. The device shall be supplied by a LPS power supply certified according to IEC/UL60950-1 or Class 2 per NEC. ↯ *'Specification of the External Power Supply' on page 19*

3.3 Applicable Directives, Standards and Compliance

The product described in the present manual complies with the CE, R&TTE directives and the FCC regulations related to the wireless modems. The product described in the present Installation Guide belongs to class A Information Technology Equipment (ITE). In a domestic environment this product may cause radio interference in which case the user may be required to take appropriate measures.

Applicable European Directives

The product described in the present manual is in conformity with the following EC directives:

- RoHS Directive 2011/65/EU
- EMC Directive 2004/108/EC
- R&TTE Directive 1999/5/EC (for versions including RF modems) The product conforms to the corresponding R&TTE articles: RF spectrum efficiency (Art 3.2); EMC (Art. 3.1b); Safety (Art. 3.1a)
- REACH Directive 2006/121/EC
- For TM-C 3G+ only: to comply with R&TTE directive
  - Antenna must be mounted on a grounded plate
  - RFI suppressors must be mounted on the power supply cable in the following order, starting at 3cm of the connector and going to the power supply:
    Würth Elektronik 742-717-33
    Würth Elektronik 742-716-22
    Würth Elektronik 742-711-11

Applicable Safety Standards

The product described in the present manual is in conformity with the following safety standards:

- IEC/EN 60950-1
- UL 60950-1
- CSA-C22.2 No 60950-1-07

FCC Compliance

The product described in the present manual complies with Part 15 of the FCC Rules. Operating is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Certifications

The product described in the present manual has been certified by authorized bodies:

- UL Certificate Of Compliance (CoC) for Ordinaty Locations # E350576 for a TMRA of 60°C
- CB certificate # DK-42240-UL

These certificates can be downloaded as PDF files on:
http://www.vipa.com/en/product/anr/900-2C5x0

3.4 Field implementation and environmental conditions

Protection grade

The VIPA TM-C has an IP20 protection grade. Therefore, the VIPA TM-C is NOT suited for outdoor mounting. It has to be integrated in an electrical cabinet, protected from excessive heat, humidity and dust. Do not push any sharp object into the air vents or openings of the equipment.

Mounting

The normal mounting position of the VIPA TM-C is wall mounted on a horizontal Omega type DIN-rail (EN 50022).

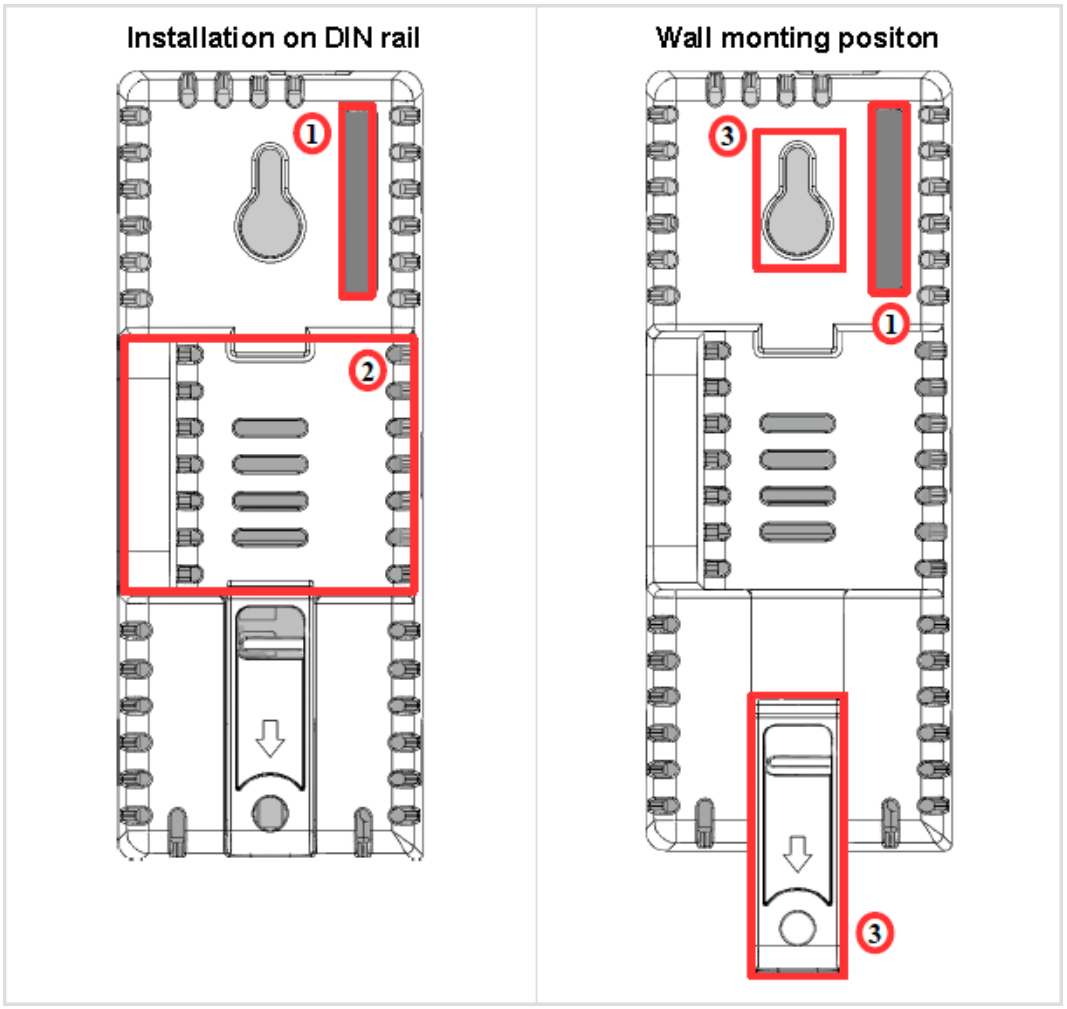
Mounting on DIN-rail

1. Pull the slide lock (located at the bottom of the unit's back-side) downwards and present the unit in front of the DIN rail.
2. Tilt the TM-C upwards in order to hang it on the upper edge of the DIN rail by its hook.
3. Gently tilt the unit downwards until it finds its original position.
4. Pull the slide lock upwards to fix and lock the unit on the DIN rail.

Removing from DIN-rail

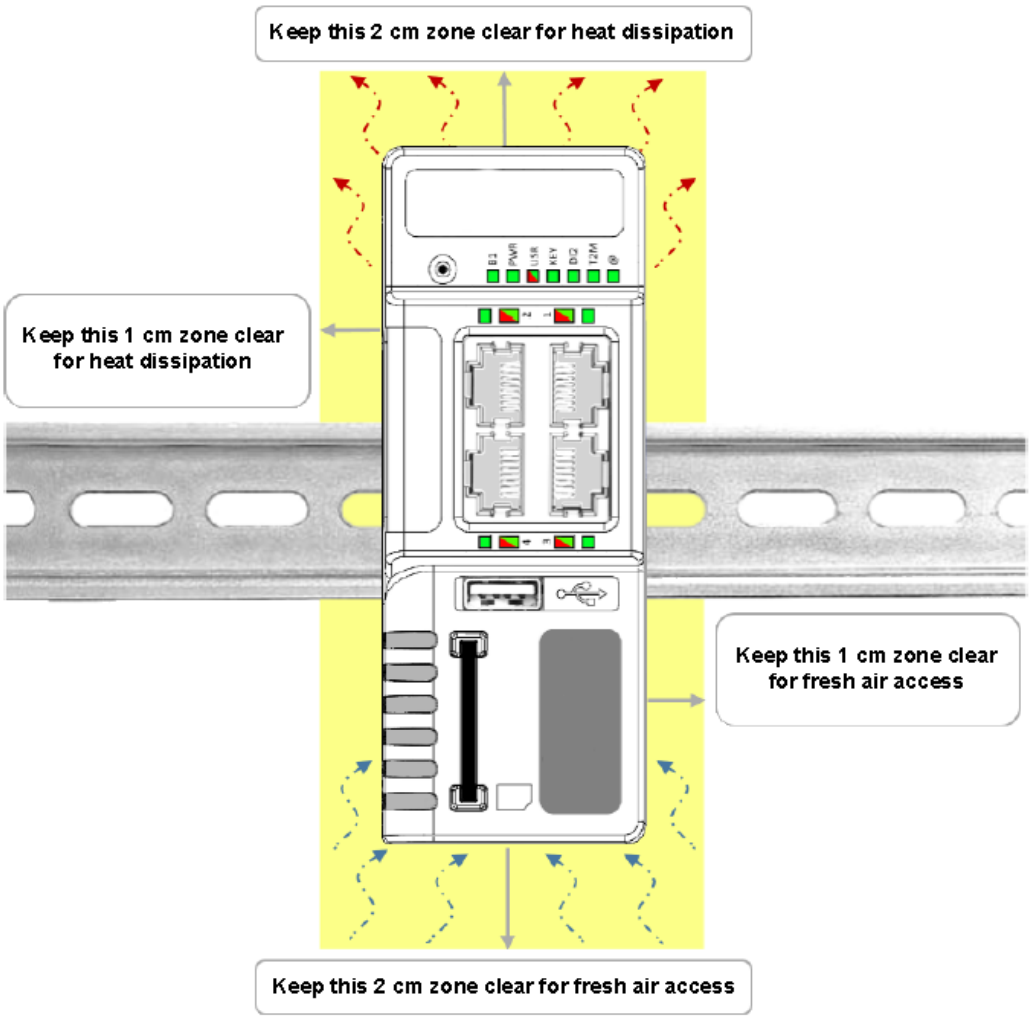
1. Release the unit by pulling the slide lock downwards while gently tilting the unit upwards.
2. Free the unit by unhooking it from the upper rail edge.

The product is intended to be mounted vertically, label on the right side.



1 SIM card slot
2 DIN rail mounting bracket
3 Screw holes intended to receive M4 screws with an 8mm diameter head

To ensure a proper ventilation of the equipment, a free gap of at least 2 cm must be respected in front of all upper & lower ventilation openings of the unit. A free gap of at least 1 cm must be respected on each side of the unit.



CAUTION!
In any other mounting position than the one explained here above, the specified temperature has to be derated to -25°C to +40°C.

Cabling

Shielded cables must be used for Ethernet and USB connectivity to comply with the EMC requirements. USB cable must be

- shorter than 3m
- USB 2.0 type
- Maximum current per contact: 0.5A (or better)
- "A" plug connected to the TM-C

Environmental conditions

The equipment will operate properly within the following environmental limits if it has been correctly mounted according to the above mentioned recommendations:

Operating temperature	-25°C to +70°C
Relative Humidity	10 to 95% non-condensing
Operating altitude	Up to maximum 2000m
Storage temperature	-40 to +70 °C
Storage Humidity	10 to 95% non-condensing
Storage altitude	Up to maximum 3000m

Earthing

Earthing the TM-C is necessary to eliminate unwanted transients (lightning protection) and to conform to the EMC requirements. Therefore, a functional earth (FE) terminal is available on the main connector ↳ *'Specification of the External Power Supply' on page 19*. Connect this terminal directly to allow impedance ground. Shielded cables have to be used for Ethernet and USB to comply with the EMC requirements.

3.5 Battery

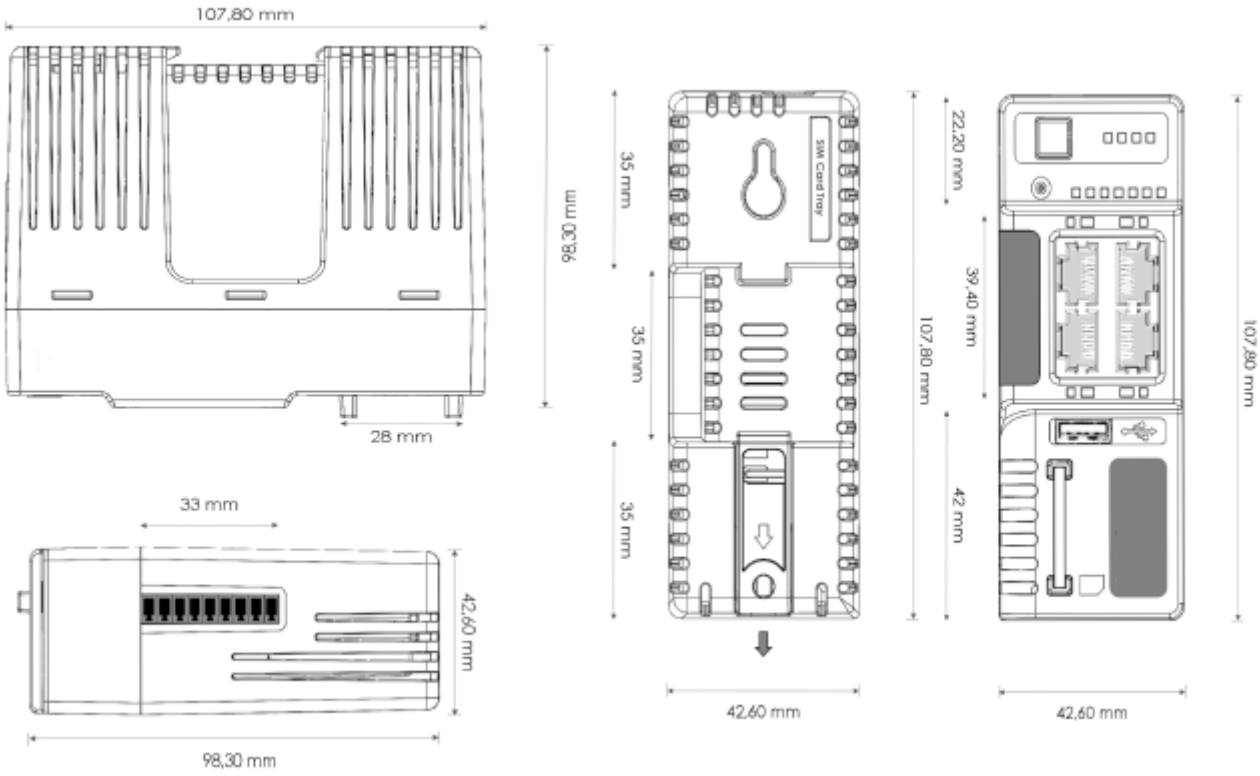
The TM-C contains a CR2032 battery. This battery is used to maintain the real time clock upto-date even when the unit is not powered.

CAUTION!
Risk of explosion if battery is replaced by an incorrect type.

The battery is not attended to be replaced on consumer's side. The product shall be returned to manufacture for replacement.

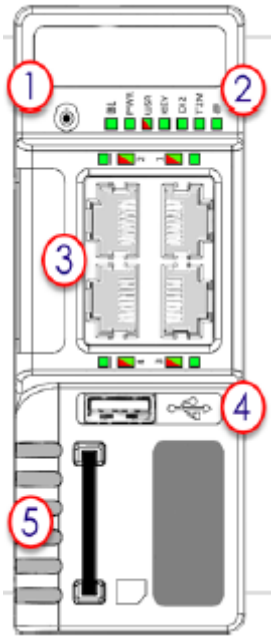
4 Hardware Description

4.1 Dimensions



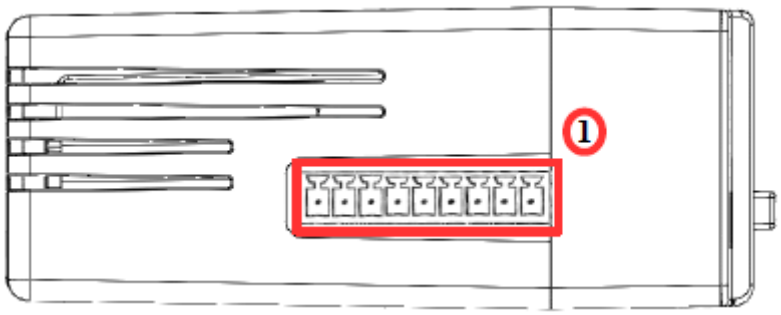
4.2 Structure

Front



1 Reset button
2 Status LEDs panel
3 LAN/WAN Ethernet ports and corresponding status LEDs (Red: WAN / Green: LAN)
4 USB slot
5 SD card slot

Upper side



1 Main connector including power input terminal, 1 DO and 2 DI

Main Connector

As shown in the picture, the female mating connector is labelled with the appropriate symbols.

Characteristic	Value
Connector type	MINICONNEC MC model Type MC 1,5/9-ST-3,5 Pitch = 3.50 mm 9-pin female

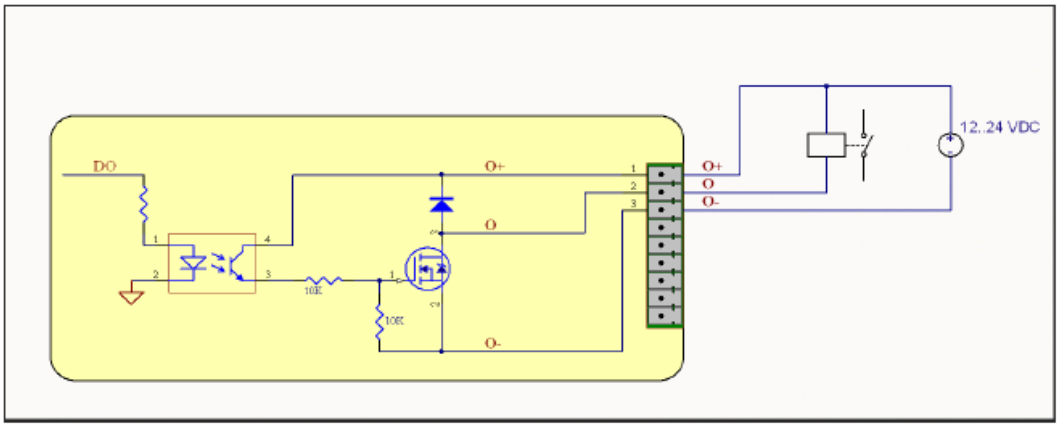
PIN	ICON	ID	Description
1	O-	DO_COM	Output signal (0V ground) connected to the emitter of the MOSFET transistor
2	O	DO	Output signal connected to the drain of the MOSFET transistor
3	O+	DO_VDC	Common of the external predrive power supply (12 - 24 VDC)
4	i-	DI_COM	Ground of the input (isolated)
5	i_1	DI1	Input signal 1
6	i_2	DI2	Input signal 2
7	+	Power in VDD +	12 - 24 VDC
8	-	Power in GND -	0V
9	⏚	Functional Earth	

Digital Output and Digital Inputs

Characteristic	Value
Type of digital output *	Open drain MOSFET
Max. current (ext. source)	200 mA
Isolation (both DI & DO)	1.5 kV
DI voltage range	0 to 24 VDC
DI protection	33 VDC Max
DI OFF state input voltage range	0 to 5 VDC
DI ON state input voltage range	10 to 30 VDC
DI ON state current range	From 3.8 mA at 12 VDC to 8,2 mA at 24 VDC
*) When the TM-C reboots, a short phase of ON state is part of the starting process.	

The digital output is activated by an open drain MOSFET transistor driven by an optocoupler. The maximum current flow inside this transistor has a value above the one specified in the TM, in order to cope with the switching power losses. The transistor used is in an open drain type with predrive. This means the relay power supply has to be supplied from an external source to the predrive electronics. The diagram below shows the external wiring needed for proper operation of the digital output. A relay has been chosen for this sample application but any load within the specifications can be used instead.

This is a sink only output to ground (the transistor acts like a switch ground).



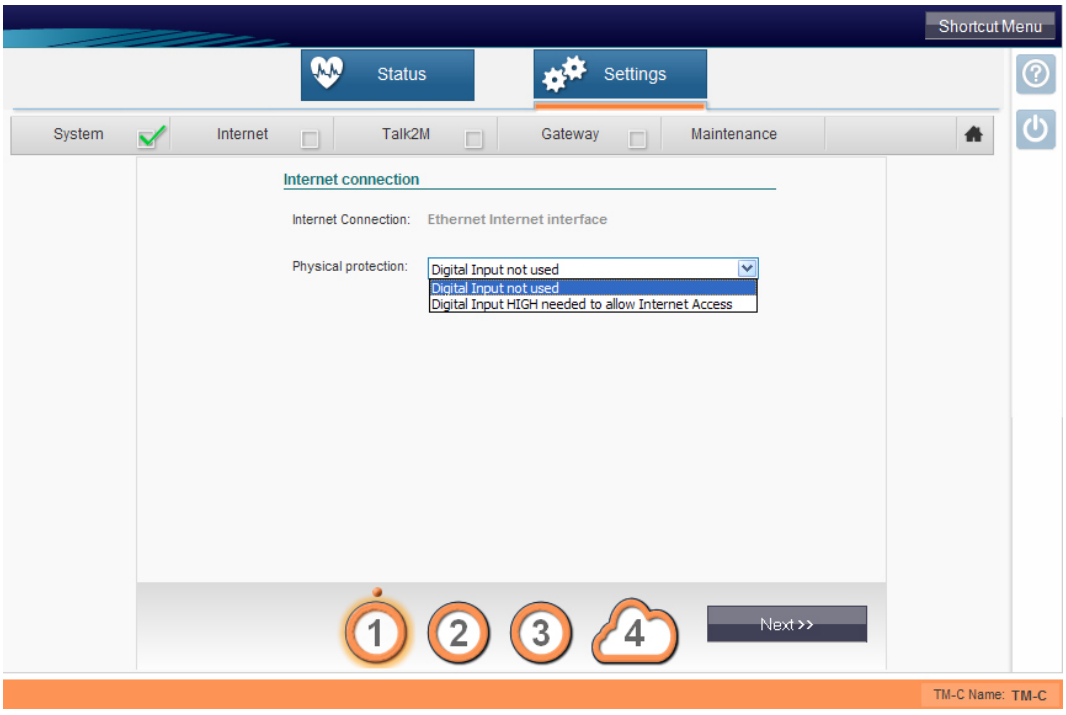
Possible features

Digital Output and Inputs can be used on the TM-C, some features can be externalized by wiring the main connector.

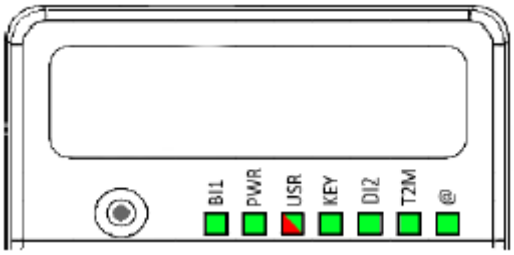
LED	Connector	Description
KEY	DI1	On a key switch to authorize or prevent the Internet connection. On a key switch to authorize or prevent the VPN connection.
DI2	DI2	Not supported.
T2M	DO	Can be wired to an external device to propagate the Talk2M status. If the VPN connection is active, the DO is set to 1.

Digital Input (DI1) can be used as a connectivity condition.

The configuration of this condition has to be done during the Internet Wizard where you define if the digital input is used or not and for which purpose.

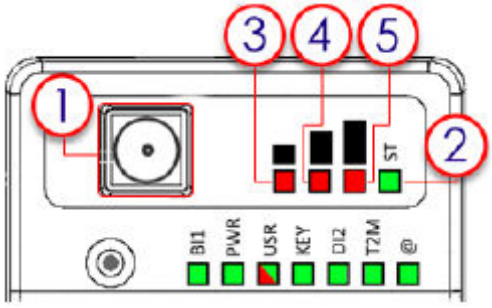


Status LED panel (All version)



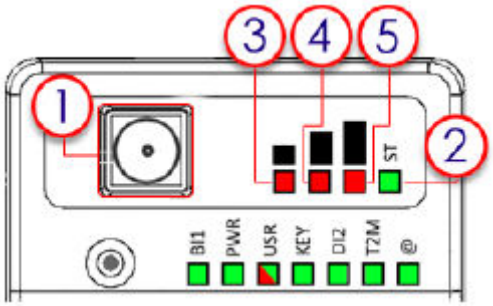
Label	Description
BI1	Button BI1 input Green ON = Reset being pressed
PWR	Power Green ON = Power is present
USR	User Green ON+OFF slowly = Unit is OK red pattern = special attention required
KEY	Digital IN 1 - Green = ON: Signal on input 1 detected
DI2	Digital IN 2 - Green = ON: Signal on input 2 detected
T2M	Talk2M - Green ON = Talk2M VPN connection established
@	Internet Green ON = Internet is configured on the VIPA TM-C

Status LED panel (TM-C - WiFi)



1 SMA male connector for WiFi antenna
2 Modem status Green ON = WiFi connected
3 Reception signal level Red ON = poor signal
4 Reception signal level Red ON = Signal is OK
5 Reception signal level Red ON = good signal

Status LED panel (TM-C - 3G+)



1 SMA female connector for GSM antenna
2 Modem status Green ON = Modem connected
3 Reception signal level Red ON = poor signal
4 Reception signal level Red ON = Signal is OK
5 Reception signal level Red ON = good signal

Specification of the External Power Supply

The TM-C must be powered by a safety Low Power Supply (LPS) in accordance with clause 2.5 of UL/IEC 60950-1 Ed2. Standard, 12-24VDC, 30W min. Certified for 60°C and for altitudes up to 2000m. The safety LPS power supply is not part of the delivery.

Characteristic	Value
Power supply voltage	external 12-24 VDC +/- 19%
Max TM input power	30W max.
Internal voltage protection	max 30V
Input protection	protected against polarity inversion

4.3 Radio communication modems

CAUTION!
This device is intended to be used in fixed or mobile applications only (not for portable applications). The antenna used for this transmitter has to be installed in a space providing a safe distance of at least 20 cm without encountering any person and must not be co-located or operating in conjunction with any other antenna or transmitter.

TM-C with internal WiFi modem

Item	Value(s)	
Protocols and Frequencies	IEEE802.11b/g/n, 2.4GHz - Channels: 1 to 11(inclusive)	
Antenna Connector	Type RP-SMA	
Antenna (included in the delivery)	**Characteristic**	**Value(s)**
	Impedance	50 Ohms
	Input Power	> 17 dBm, IEEE 802.11b > 15 dBm, IEEE 802.11g/n

Item	Value(s)	
	Tightening Torque	0.5 Nm. In the absence of a torque wrench, a soft manual tightening is sufficient.
Device conformity has been tested with the reference antenna: Pulse W1030.		

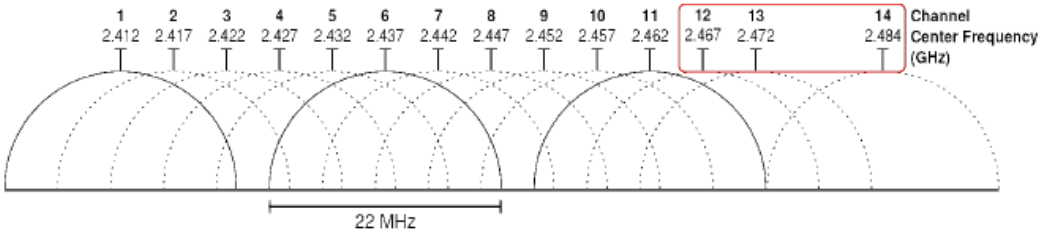
- The product complies with the R&TTE directive, the FCC, the IC and Japan regulations related to the WiFi communications.
- Absolute maximum antenna gain as per FCC's rules and regulations, 47CFR: Part 15C: 2.14dBi
- Modifications cannot be made by the user if it influences the normal behaviour of the device.
- The user shall be informed about modem identification numbers according to their national authorities. This product contains part identified as follows by national authorities:
  - FCC ID: QOQWF111
  - IC ID: 5123A-BGTWF111
  - RRA ID: KCC-CRM-BGT-WF111
  - GITEKI (MIC) ID: 209-J00061

TM-C with internal 3G+ modem

Item	Value(s)
Protocols and Frequencies	GSM/GPRS/EDGE - 850, 900, 1800, 1900 MHz UMTS/HSUPA - 800/850, 900, AWS 1700, 1900, 2100 MHz
Class	5 bands GPRS/EDGE Class 33
Antenna Connector	Type SMA
Antenna	GSM/GPRS/UMTS antenna is available from VIPA with 900-0AB51 as reference

- The product complies with the R&TTE directive, the FCC, the IC and Japan regulations related to the GSM modems.
- Absolute maximum antenna gain as per FCC's rules and regulations, 47 CFR :
  - Part 22H: 5.22dBi
  - Part 27: 3.31dBi
  - Part 24E: 6.45dBi
- Modifications cannot be made by the user if it influences the normal behaviour of the device.
- The user shall be informed about modem identification numbers according to their national authorities: This product contains part identified as follows by national authorities:
  - FFC ID: RI7HE910
  - IC ID: 5131A-HE910
  - GITEKI (MIC) ID: 005-100269
  - JATE ID: AD12-0318001

Used Wireless Frequencies



- Channels 12, 13 & 14 are not supported
- Used channels and frequencies are between: Channel 1 - 2,412 Ghz and 11 - 2,462 Ghz

4.4 LAN Switch Specifications

Boot process

During the (re)boot process, the TM prevents the switch feature from working. This means that it might require little time starting from the power on (or the reboot request) to get the LAN switch to be fully operational. When an TM router is configured to operate a certain way, it is part of the strategy, if no other method worked, to reboot itself. This is the ultimate TM strategy to try restoring the requested communication channels and be consistent with requested configuration.

5 IP Address and Access to the Web Configuration

5.1 Factory Default IP settings

Characteristics	Value(s)
LAN IP Address	10.0.0.53
LAN Subnet Mask	255.255.255.0

5.2 Powering ON

→ Power on the unit and wait approximately 25 sec. until the boot process is finished.

⇨ After a successful boot process the "USR" LED is flashing green ON and OFF slowly. If the "USR" LED is flashing red according to a given pattern, it indicates that the boot process was interrupted due to a problem.

Most frequent problems include:

- a duplicate IP address was detected on the LAN Network "USR" LED flashing pattern is red 1x short, 1x long

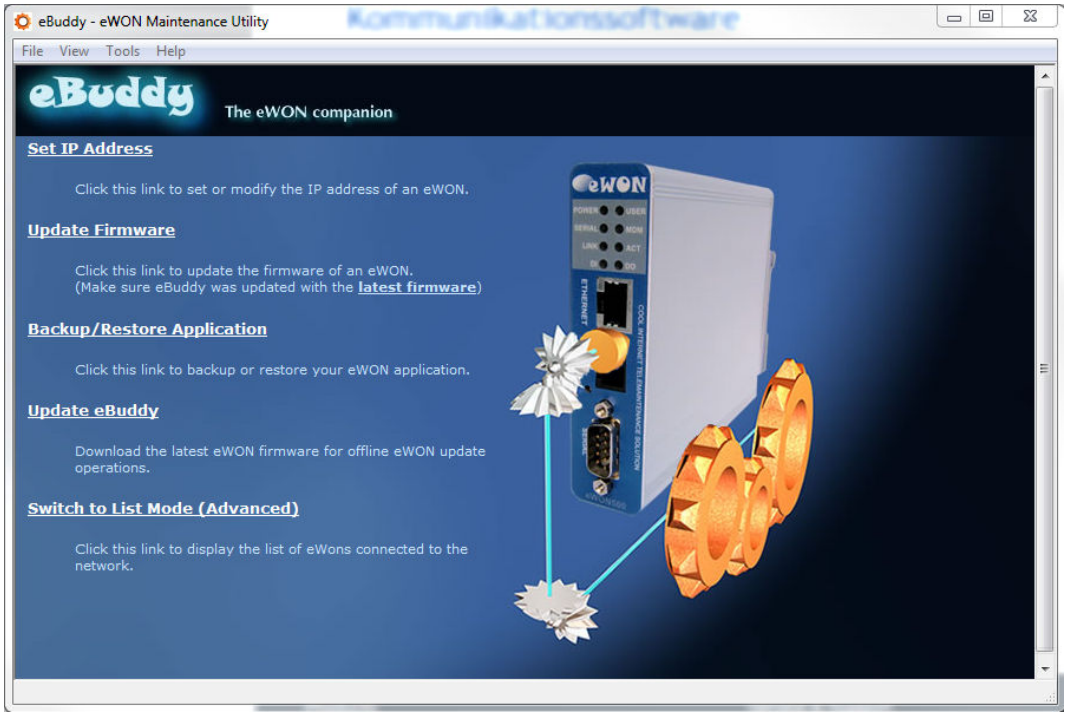
5.3 Setting the TM-C LAN IP Address

You can easily establish your first communication with your TM-C by using our companion tool *eBuddy* which can be downloaded from *www.vipa.com* under *'Service-Support ➔ Downloads ➔ Software'*.

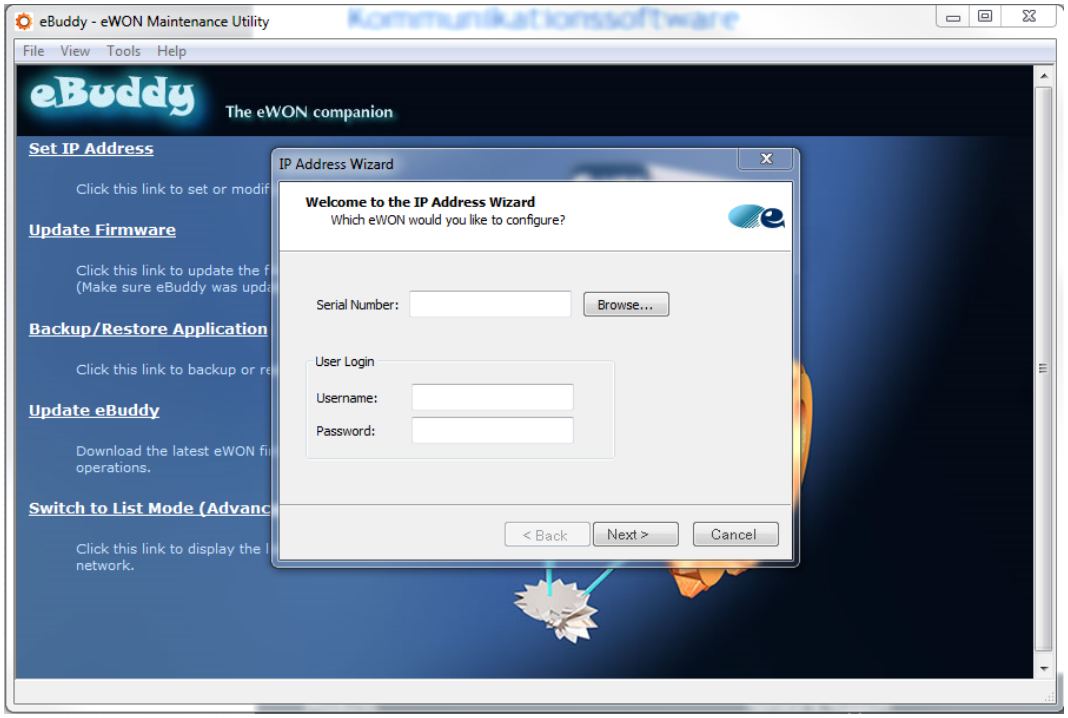
Connect one of the LAN-ports (by default, port No. 1 is always a LAN port) of your TM-C with your PC point-to-point or through a network where there is no risk that the TM's default IP-address (10.0.0.53) would conflict with another connected device.

Start the *eBuddy* application. This one scans the network through the Ethernet adapter and retrieves the connected TM, including its IP address, Subnet Mask and serial number. The application also allows you to change the default IP address without being necessarily in the same network range.

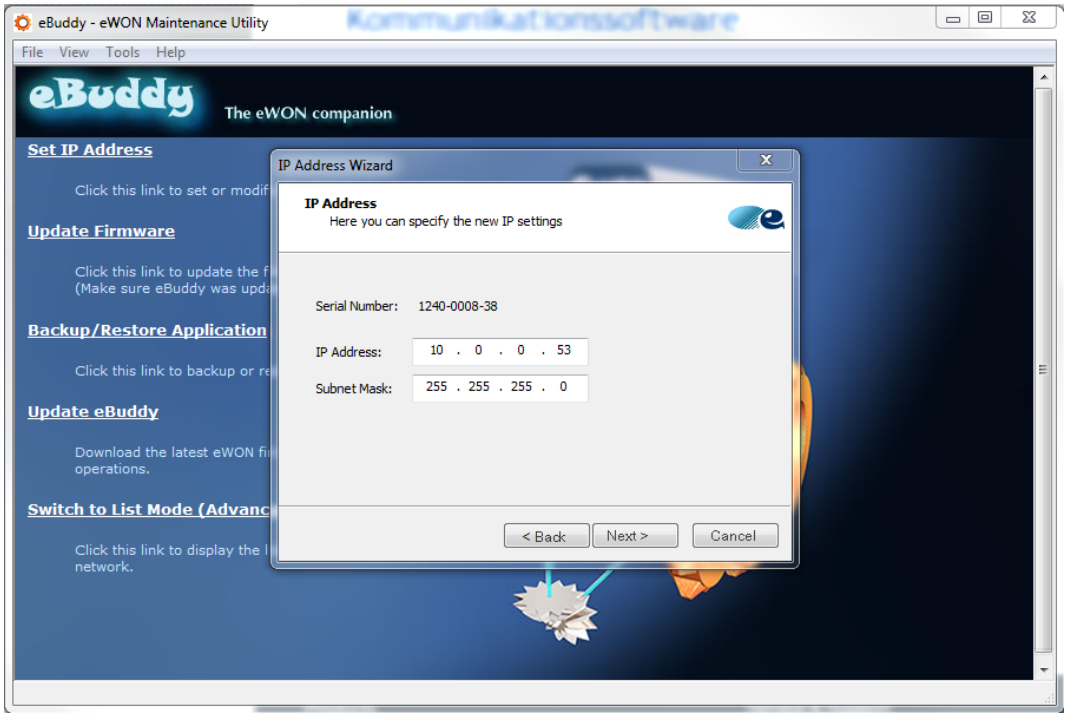
1. Start the *eBuddy* utility on your PC in the home page. Select "Set IP Address".



2. Fill in the Serial Number of your TM-C or click on [Browse...] and select it. The Serial Number of the TM-C is on its label. Click [Next].



3. Enter a new LAN IP address and Subnet Mask. Click [Next].



4. Wait until the address is updated and the device has rebooted. Click [Finish].

5.4 TM-C Web Interface

To access the web pages of your TM-C proceed as follows:

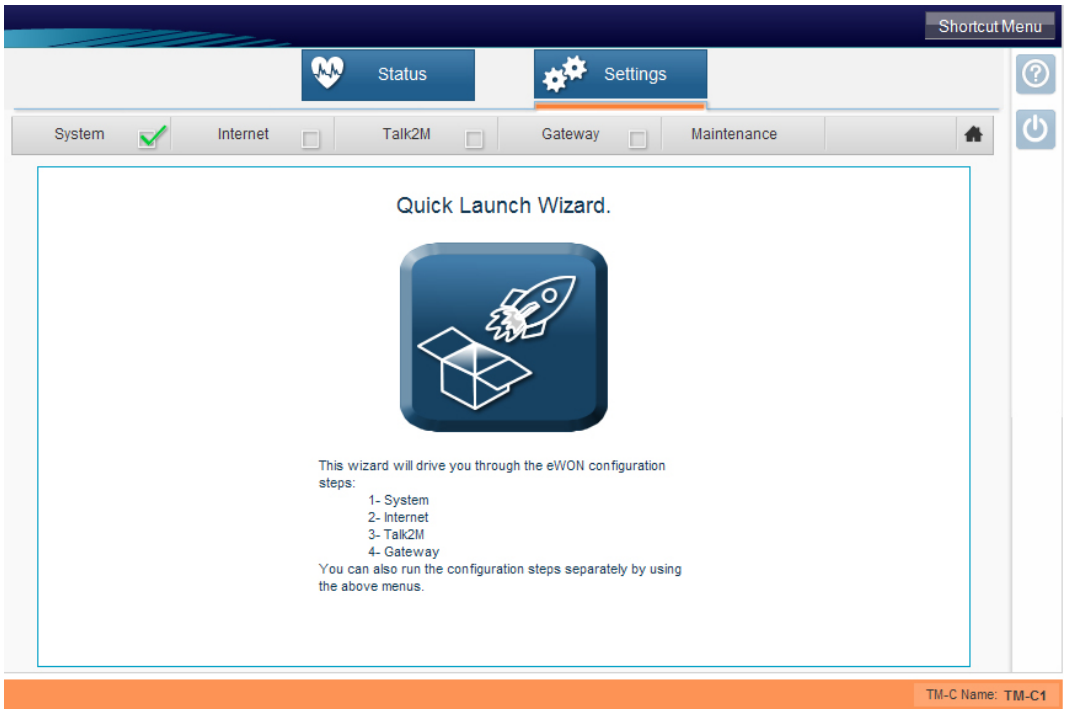
1. Connect the PC to one of the LAN port of the TM-C.
2. Open your Internet browser and access the TM-C internal Web page by entering the LAN IP address in the URL field (the default address is http://10.0.0.53).

   ⇨ You arrive on a loading page.
3. If this is the first boot of the TM-C (or after a level 2 reset), you will be asked for a default language.

4. Before configuring your TM-C, an authentication is required. For a first boot, the default login and password are both “adm”.

> **CAUTION!**
> For security reasons, changing the default password "adm" is absolutely required.

⇨ You will be automatically redirected to the Quick Launch Wizard page:



5. You can follow the Quick Start Guide as an aid to configure your TM-C. Can be downloaded on www.vipa.com under *‘Service-Support ➔ How-to-do ➔ Teleservice’*.

6. To reconfigure your TM-C, you can easily rerun the wizard by clicking on the "Settings" button on top of the page.

6 Troubleshooting

6.1 Normal Boot Process

The normal boot process of the TM-C takes approximately 25 seconds to complete. During this process, all LEDs are shortly ON, except "BI1" as long as the RESET button is not pressed. During this boot sequence, the "USR" LED is orange. As soon as the boot process is finished and the unit is ready to be used, the "USR" LED flashes green slowly.

6.2 Resetting the TM-C

The reset button "B1" is located on the front of the TM-C unit. The reset function of this button is active only if pressed while powering on. The TM-C features two type of reset levels. A table follows with the impacted configuration zones per reset level.

6.3 First Level Reset (user reset)

The first level reset consists in formatting only the "user files" part of the non volatile memory. This type of reset does not modify the communication parameters of the TM-C.

How do I generate a first level reset?

1. Power the unit OFF and ON again
2. Immediately press and maintain the reset button. The LED labeled "BI1" turns ON.
3. Wait approximately 30 seconds until the "USR" LED flashes red 1x per second.
4. Immediately release the button (if you don't, you would reach the second level reset phase). The LED labeled "BI1" turns OFF.
5. Wait approximately 30 secs until the reset procedure is completed.
6. The TM-C restarts automatically and the unit is ready to be used, the "USR" LED flashes green slowly.

6.4 Second Level Reset (factory reset)

This second level reset formats the entire non volatile memory and returns the TM-C to its factory settings. This operation consists in 3 steps:

1. Formats the entire non volatile memory, including all COM parameters and IP addresses
2. Full hardware auto-test with result shown by the "USR" LED
3. Return to ex-factory configuration (default config)

How do I generate a second level reset?

1. Power the unit OFF and ON again
2. Immediately press and maintain the reset button. The LED labeled "BI1" turns ON.
3. Wait approximately 35 seconds until the "USR" LED remains RED steady.
4. When this state is reached, release the button. The LED labeled "BI1" turns OFF.
5. It takes no longer than 2 seconds to complete.
6. Check if the auto test is successful, the "USR" LED flashes red with a pattern of 200ms ON and 1.5 sec OFF*. The TM-C does NOT restart in normal mode by itself and remains running in this diagnostic mode.

7. You have to power the TM-C OFF and ON again to reboot the unit in normal mode. As described before, the TM returns to its default COM parameters and factory IP addresses (like LAN 10.0.0.53) after this level 2 reset is performed.

*) Any other pattern reflects a problem. The pattern will start with 200ms ON (opening of the pattern) followed by OFF and a certain number of times of a 1 sec ON allowing to identify the nature of the detected problem. If you were to be confronted with an error pattern on the "USR" LED, please write down the pattern you observed and contact your distributor.

6.5 Reset Impact Matrix

	Erased or Reset	Preserved
Impact Reset Level 1 (user reset)		LAN IP address + mask
	adm password	Internet access
		Language settings
	TM-C Identification	Modem/ WiFi settings
	User Web site	Talk2M config
		Proxy configuration
Impact Reset Level 2 (factory reset)	adm password	Nothing
	TM-C Identification	
	User Web site	
	LAN IP address + mask	
	Internet access	
	Language settings	
	Modem/ WiFi settings	
	Talk2M config	
	Proxy configuration	